

REMARKS

By this Response, claims 1, 6, 7, 11 and 15 have been amended. Claims 17-20 have been added and claim 4 has been previously canceled. No new matter has been entered into the application. Claims 1-3 and 5-20 are pending.

At the outset, the Examiner is thanked for the consideration given during the personal interview of January 11, 2007. In the Interview, the prior art and proposed amendments to the claims were discussed. The difference in the thickness of the bottom layer of the trench versus the sidewalls thereof was pointed out, and that the reference is silent as to this difference. The Examiner agreed that the claim amendments overcome the applied references at this time, and will make a final review upon submission of this response.

Claim Objections

In the Office Action, the Examiner rejected claim 5 under 37 C.F.R. 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. The Examiner has requested that the claim be canceled, amended, or rewritten in response to the objection.

Responsive to the objection, claim 5 is dependent from claim 3 and claim 2. Claim 2 is directed to a "second" trench, and the recitation of claim 5 therefore defines a relationship of  $X_1$  in the second trench. For this reason, no further amendments have been made to claim 5.

Accordingly, withdrawal of the objection to claim 5 is respectfully requested.

Rejection of Claims 1-3 and 6-16 Under 35 U.S.C. § 103(a)

In the Office Action, the Examiner rejected claims 1-3 and 6-16 under 35 U.S.C. § 103(a) as being unpatentable over *Cohen* (U.S. Patent No. 6,518,668) in view of *Satta et al.* (U.S. Patent Publication No. 2004/0121616). This rejection is respectfully traversed.

The subject matter of independent claims 1, 7, 11, and 15 are directed to a (copper) integrated circuit interconnect structure and method. Each independent claim further recites structure or method directed to a low K dielectric layer with an upper surface formed over a semiconductor; a first trench formed in said low K dielectric layer wherein said trench has sidewalls; a first contiguous barrier layer formed to a thickness  $X_1$  over said upper surface of said low K dielectric layer within said trench and formed to a thickness  $X_2$  on said trench sidewalls wherein  $X_1$  is greater than  $X_2$ , wherein the ratio  $X_1$  to  $X_2$  is greater than 3 to 2; and copper formed over said first contiguous barrier.

It is the Examiner's position that *Cohen* discloses, in Figure 1 thereof, an integrated interconnect structure comprising a dielectric layer 12 over a semiconductor 10; a first trench formed in the dielectric layer, the trench having sidewalls; a first contiguous barrier layer 18 formed to a thickness  $x_1$  over the upper surface of the dielectric layer and formed to a thickness  $x_2$  on the trench sidewalls wherein  $x_1$  is greater than  $x_2$  with a ratio of 3 to 2 (referencing col. 7, lines 3 and 4 thereof), and copper over the first barrier layer (referencing col. 6, line 46 thereof). The Examiner acknowledges that *Cohen* fails to disclose the dielectric layer as a low K dielectric. Accordingly, *Satta et al.* has been applied in combination with *Cohen* as disclosing a low K dielectric material.

To the contrary, it is respectfully submitted that the independent claims now clearly recite that the deposition at  $X_1$  is within the trench or trenches. That portion of *Cohen* referred to by the Examiner as describing a thickness on the dielectric being greater than a thickness on the sidewalls in fact refers to deposition on field 14 (non-trench) relative to deposition within the trench. As described by *Cohen* in column 7, lines 1-3, the total deposition within the trench (openings) is about 50% of that on the field 14. Note that field 14 is further defined in *Cohen* as "the top surface (field 14) surrounding the openings" in column 5, lines 25-26 thereof. The openings are the trench openings 16 as described in column 5, lines 51-53 of *Cohen*. Accordingly, *Cohen* fails to teach or suggest a deposition within the trenches at a surface of the dielectric and the sidewalls having the layer ratios set forth in the independent claims. The disclosure of a low K dielectric in *Satta et al.* fails to overcome the deficiency of *Cohen*.

In addition, the deposition resulting in non-conformal layers at  $X_1$  and  $X_2$  is intentional in the present invention and is defined by a controlled dielectric pore penetration on the trench sidewalls in a manner neither taught nor recognized by either of the applied references.

Accordingly, Applicants respectfully request that the Examiner reconsider and withdraw the rejection of claims 1-3 and 6-16 under 35 U.S.C. § 103(a). Applicants respectfully submit that claims 2-3, 5-6; 8-10; 12-14; and 16 are in condition for allowance, at least by virtue of their dependency from allowable claims 1, 7, 11 and 15, respectively.

**CONCLUSION**

In view of the foregoing remarks, Applicants submit that this claimed invention is neither anticipated nor rendered obvious in view of the prior art references applied against this application. Applicants therefore request the Examiner's reconsideration and reexamination of the application, and the timely allowance of the pending claims.

Please grant any extensions of time required to enter this response and charge any additional required fees to our deposit account 20-0668.

Respectfully submitted,

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